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Study of longitudinal spin structure of nucleon in COMPASS[1]

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The nucleon spin structure is studied in COMPASS at CERN by the measurement of the double spin asymmetry of the deep inelastic scattering of a polarized muon at 160 GeV off a polarized deuteron target. Thanks to the COMPASS spectrometer equipped with a RICH, semi-inclusive events are detected as well as the inclusive ones. This allows to access, in particular, the gluon polarization ($\Delta G/G$) and flavor decomposition of the quark helicity distributions. The gluon polarization is studied via the photon-gluon fusion process(PGF), whereby a $q\bar{q}$ pair is produced from a gluon coupled with a virtual photon. Two different selections of the PGF are attempted: 'open charm production' and 'high P_T hadron production' . In the former selection, the charmed meson decay, $D^0 \to K^- + \pi^+$, is selected. In the latter selection, events including two hadrons with high P_T are selected. In the both selections, hard scale is satisfied with, respectively, the charm mass and the P_T cut. Hence, one can rely on pQCD. From the double spin asymmetry of the PGF process, the gluon polarization is evaluated with a help of the polarized cross-section of the elementary process calculated by the pQCD. The 'open charm production' has an advantage with less background although it gives poor statistics. On the other hand, the "high P_T hadron production' gives better statistics and larger background. The background comes from the leading process and the QCD Compton process. They are carefully evaluated with Monte Carlo simulation in order to extract the gluon polarization. The experiment has accumulated data both with a longitudinally and transversely polarized targets in its 3 years running from 2002 to 2004. The analysis of the data is in progress. The results of the analysis of the data obtained with a longitudinally polarized target are presented.

[1]On behalf of the COMPASS Collaboration